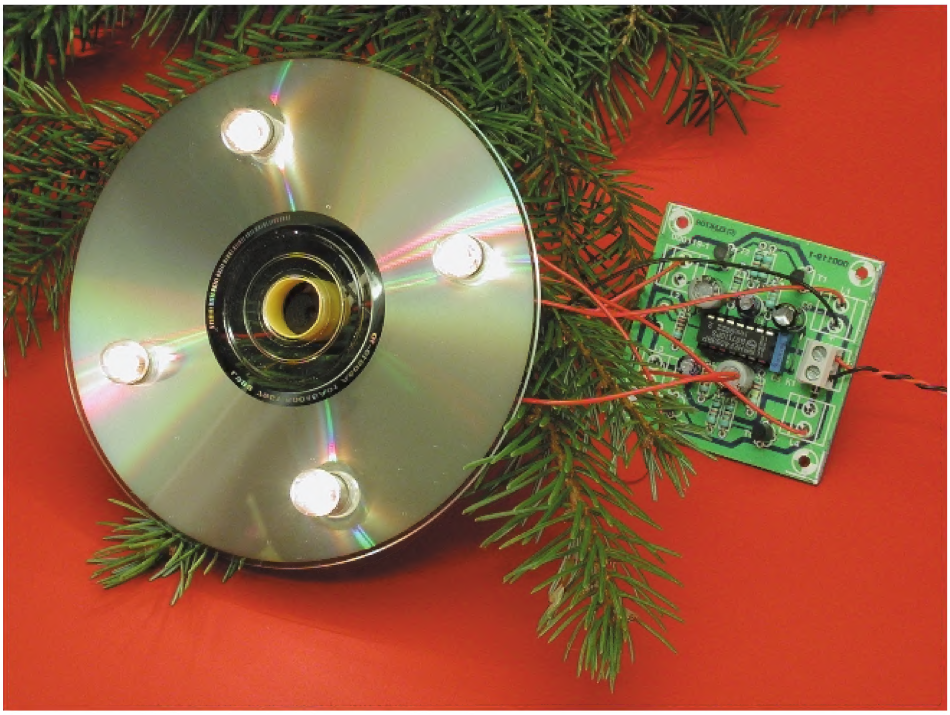
A CD for Christmas

tasteful lighting effects

By S. van Rooij (text) and P. Lay (design)

By now, loyal readers probably expect that every year around the holiday season, *Elektor Electronics* will come up with a playful circuit that provides an original touch in or around the Christmas tree. This year, our starting point is a compact disc.



Admittedly, this is naturally nothing more than 'fooling around'. Still, we know that most electronics enthusiasts enjoy doing something unusual for Christmas decorations. Some of the standard lighting ornaments that you can find in the department store bins are attractive enough, but everyone already has them. If you are an electronics hobbyist and you want to make a good impression, you will have to think of something somewhat original. In order to stimulate this a little bit, *Elektor Electronics* regularly provides some suggestions.

The example described here is a very simple design. There is no talk of processors or other difficult-to-use components. Although we make use of a modern medium in the form of a CD(ROM), if you read on you will quickly see that we use the CD in a rather improper manner.

Reflector

Practically every hobbyist should have a few surplus CDs lying about, and the basic idea is to use one of them as a sort of reflective screen. If a lamp is held in front of a CD, colour fringes appear in the reflection, and this is naturally an effect that we can happily put to good use in a Christmas decoration.

So what's it all about? You can get an impression from the photo accompanying this article. Four holes are drilled in the CD, and four small incandescent lamps are mounted in these holes. We have intentionally used lamps here, since they emit a broader spectrum of light than LEDs and thus provide more colourful reflections from the silver disk. The lamps are switched on and off rhythmically, each at a different rate. This creates an especially unusual effect. An LDR is placed in the middle opening of the CD. This forms part of a twilight switch, which ensures that the ornament lights up only when the room is dark.

Schematic

A glance at **Figure 1** clearly shows that the design of the electronics that must provide the lighting effects is very simple. Four oscillators, four transistors and four lamps — that's about all there is to it.

The twilight switch consists of nothing more than a voltage divider (R7/R8). When it becomes dark, the resistance of LDR R8 increases, and

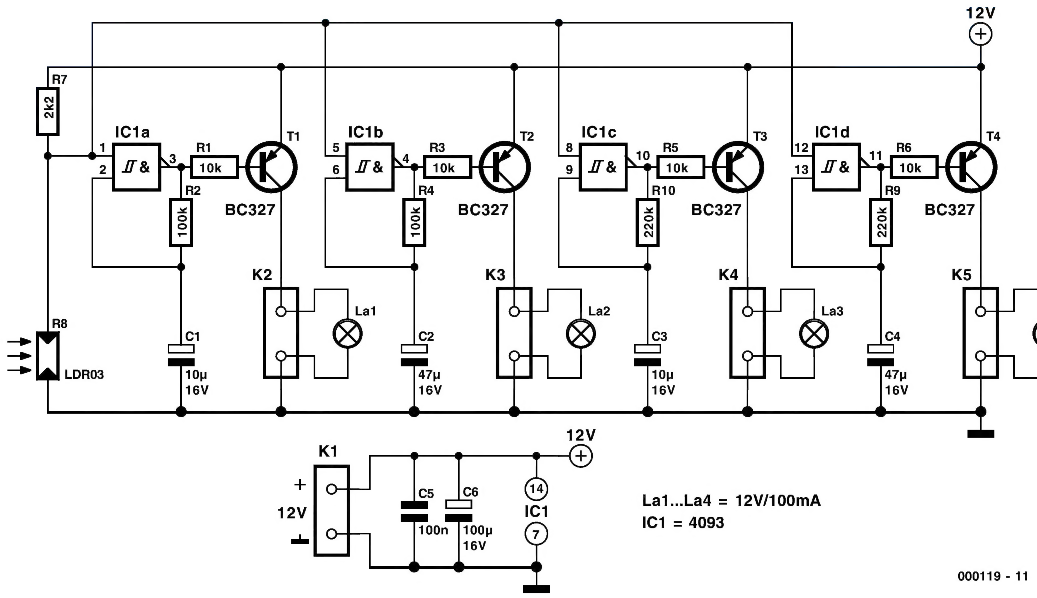


Figure 1. Four oscillators and four small incandescent lamps are all you need for festive lighting effects.

the four 4093 oscillators are enabled. The four lamps are then driven in flashing rhythms that are determined by the RC networks R2/C1, R4/C2, R10/C3 and R9/C4. Since all four networks have different component values, the lamps will flash completely asynchronously. In practice, this proved to give the nicest effect. Naturally, you can adjust the pattern to suit your own taste by modifying the values of the frequency-determining components.

Construction

The printed circuit board shown in **Figure 2** has been developed for this circuit. In light of the simplicity of the electronics, the construction of the printed circuit board hardly needs any further explanation. The simplest way to mount the circuit board is to use four standoffs to fasten it directly to the back of the CD. The lamps can be connected using short lengths of wire. There is room on the circuit board for four terminal blocks, but the lamp wires can of course be soldered directly to the appropriate locations on the board instead.

Two connector pins are provided on the board next to R7 for connecting the LDR. As already mentioned, LDR R8 is fixed in the centre hole of the CD. A small cardboard tube can be used to screen the LDR against being affected by undesired light.

A standard 12-V mains adapter (500 mA) can be used as a power source. If you make things robust enough, you may even be able to hang the combined CD and circuit board from its power-supply wires as a sort of oversized Christmas ball. Merry Christmas!

(000119-1)

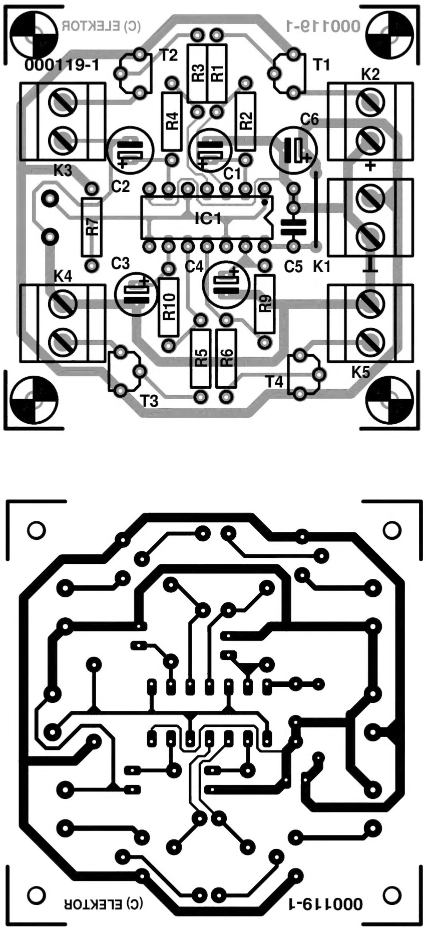


Figure 2. Printed circuit board layout for the 'Christmas CD' (not available ready-made).

COMPONENTS LIST

Resistors:
R1,R3,R5,R6 = 10kΩ
R2,R4 = 100kΩ
R7 = 2kΩ2
R8 = LDR03 (Eurodis, Bolton)
R9,R10 = 220kΩ

Capacitors:
C1,C3 = 10µF 16V radial
C2,C4 = 47µF 16V radial
C5 = 100nF
C6 = 100µF 16V radial

Semiconductors:
T1-T4 = BC327
IC1 = 4093

Miscellaneous:
K1-K5 = 2-way PCB terminal block, lead pitch 5mm
La1-La4 = miniature bulb, 12V/100mA
Surplus CD